Final corrected version for DRO

Worker Representation and Temporary Employment in Germany: The Deployment and Extent of Fixed-Term Contracts and Temporary Agency Work

John T. Addison,* Paulino Teixeira,** Philipp Grunau,*** and Lutz Bellmann****

** Department of Economics, Darla Moore School of Business, University of South Carolina, Department of Economics and Finance, Durham University Business School, and IZA Bonn*
***Faculdade de Economia, Universidade de Coimbra, CeBER, and IZA Bonn*
****Institut für Arbeitsmarkt- und Berufsforschung, Bundesagentur für Arbeit*
*****Institut für Arbeitsmarkt- und Berufsforschung, Bundesagentur für Arbeit, Universität Erlangen-Nürnberg, and IZA Bonn*

Abstract
This study examines the potential impact of works councils and unions on the use and intensity of use of fixed-term contracts and temporary agency work. There is little indication that these variables are correlated with the use/non-use of either type of temporary work, especially in the case of fixed-term contracts Collective bargaining displays different relationships with their intensity of use: a negative association for sectoral bargaining and fixed-term contracts and the converse for firm-level bargaining and agency temps. Of more interest, however, is the covariation between the number of temporary employees and the interaction between works councils and product market volatility. The intensity of use of agency temps (fixed-term contracts) is predicted to rise (fall) as volatility increases whenever a works council is present. These disparities require further investigation but most likely reflect differences in function, with agency work being more directed toward the protection of an arguably shrinking core and fixed-term contacts encountering resistance to their increased use as a buffer stock. The two types of temporary employment are seemingly noncomplementary, an interpretation that receives support from the study's further analysis of fixed-term contract flow data.

JEL Classification: J21, J23, J41, J 48, J51, J63, K31

Keywords: agency temps, fixed-term contracts, stepping stones, buffer stocks, labor market duality, extensive/intensive margins, works councils, unions, collective bargaining, demand volatility, complementarity, Germany

I. Introduction

In Germany, as in other countries, controversy attaches to the use of temporary employment. On the one hand, it has been linked to heightened labor market duality, and on the other to increased labor market flexibility offering improved labor market access and fostering job creation. But the tenor of the German debate has differed somewhat from that in other countries given that nation's unique performance during the Great Recession in 2008/9, when it was able to successfully negotiate economic adversity without an increase in unemployment or a decline in the number of jobs. That experience may at once have both reflected and further influenced the thinking of key players – unions, works councils, and employers – on temporary employment; with the worker side being more accepting of it and employers for a variety of reasons (including it must be said the prospect of *reregulation*) being less motivated to use temporary employment as a low-road strategy. The two types of temporary employment considered in the present treatment are temporary agency work/workers (TAW/TAWs) and fixed-term contracts (FTCs). Even if they may be less atypical or contingent than other non-standard types of employment in Germany, such as marginal part-time work, both can be compared – provisionally at least – with their counterpart entities in other nations.

Other-country research, and typically that in the Anglo-Saxon tradition, has tended to focus upon employment transitions and whether or not temporary employment functions as a stepping stone to regular employment, with frankly pessimistic conclusions on net. (This is particularly true of U.S. studies of temporary agency employment; see, for example, Addison and Surfield 2009; Houseman 2014.) Although a major component of the German literature has not shied away from equating agency work in particular with precarious employment and the notion of a shrinking core (of regular employment), German research has tended more to look at issues such as the operational reasons for using different types of temporary work, issues of intensity of use, and, most recently, the role of temporary agency work in particular as a driver of labor market dynamism leading to higher productivity and enhanced job security of regular workers without impairing the job access of temps themselves.

But the fact remains that in Germany as elsewhere our knowledge of temporary employment remains partial at best. Nowhere is this more apparent than in the context of the role of institutions, the topic of the present inquiry. Only latterly have studies sought to incorporate worker representation in works councils and unions and the interplay between these institutions and product market volatility and even to distinguish between types of temporary employment in this regard. Our treatment is firmly anchored in this new institutionalist tradition. Specifically, it seeks to examine the effect of workplace representation and collective bargaining on the use and the intensity of use of temporary employment over the sample period 2006-2015, distinguishing between FTCs and TAW. The potentially crucial role of product market volatility in shaping the response of labor market institutions is accorded special emphasis, not least since this interplay may assist in explaining the different effects of 'unions' reported in a literature that has neglected the volatility argument.

The structure of the paper is as follows. Section II contains a thematic review of the literature on temporary employment together with some key theoretical expectations. The principal dataset employed here, the IAB Establishment Panel, is addressed in section III. Section IV contains the distinctive model used in this empirical inquiry and its justification. Detailed findings are presented in section IV and are followed by a sensitivity analysis in section VI. Section VII concludes.

II. Literature Review

The literature on temporary employment has focused on FTCs and TAW without necessarily considering both or distinguishing between them. Where the two have received separate consideration, attention has tended to focus on either their contribution to flexibility in markets often characterized by tightly regulated open-ended employment or, more commonly perhaps, on their impact as stepping stones to regular employment as opposed to a being a dead end outcome associated with heightened labor market duality. Our review of the *German* literature will necessarily touch upon issues that have preoccupied the wider literature not least because our sample period follows intervals of liberalization of the rules governing the two types of contract, especially temporary agency work. That said, an important part of our discussion we will pay close attention to two other-country studies that offer guidance as to the likely impact of worker representation and collective bargaining on the occurrence and extent of FTCs and TAW. Very few German studies have directly investigated the impact of works councils and collective bargaining on temporary employment. This is in sharp contrast with the literature on workplace representation and firm performance where German studies have been in the vanguard (see Addison 2009).

Our opening descriptive remarks will form the backdrop to the labor institution questions that motivate the present analysis. They cover the course and role of TAW and FTCs over most of our sample period and are well rehearsed in survey papers by Spermann (2011) and Eichhorst and Tobsch (2013). The former study charts the major growth in agency work after the Hartz 1 reforms in Germany (see the Legal Appendix in Addison et al. 2018: 28). Spermann notes that staffing agencies were the leading drivers of job creation. Even if their penetration rate (i.e. their share of all workers covered by social insurance) is reported as only 2.6% and procyclical, the share of TAWs among individuals entering and leaving the workforce is considerable. The stepping-stone hypothesis is also addressed by Spermann, who observes that although there is little general evidence favoring the argument that temporary employment acts as a springboard into regular employment, TAW has an access-to-work function improving the likelihood of the unemployed being employed in the future (Kvasnika 2009), even in open-ended employment (Lehmer and Ziegler 2010).[1]

Spermann's review is particularly useful in documenting who uses TAW, the reasons for so doing, and the intensity of use. To illustrate, some 3% of enterprises used agency temps in 2008, usage being heavily dependent upon firm size with almost one-quarter of mid-sized enterprises (50-249 employees) and one-half of large enterprises (≥250 employees) making use of temps between 2003 and 2005. Intensity of use also varies directly with firm size (Crimmann et al. 2009). Among the structural (e.g. industry affiliation) and functional factors (e.g. firms undergoing organizational transformation), Spermann cites work by Promberger (2009) indicating that the deployment of temporary work arrangements is more likely in enterprises with a works council, the stated justification being that 'moderate' use of TAW helps secure the jobs of the permanent workforce.[2]

Eichhorst and Tobsch (2013), while focusing on the theme of labor market segmentation more generally, seek to draw a distinction between fixed-term contracts and agency temporary work. Fixed-term contracts are said to mainly affect job entrants in the private sector, apprentices, and mostly young employees in the public, academic, and social sectors. Agency temps for their part are mainly concentrated among basic occupations in the manufacturing sector and some office

services offering more limited prospects for transition to permanent jobs. FTCs have remained constant at about 7 to 8% of total employment, although this total excludes about the same share in apprenticeship contracts proper. TAW has grown since 2001 but, as noted earlier, it accounts for a much smaller share of total employment. Its growth is primarily attributed to labor market reforms and related restructuring of companies in the manufacturing sector since the mid-2000s. That said, we also note that this acceleration has been outpaced by the growth in part-time work and marginal part-time work.

Although Eichhorst and Tobsch report that there is significant mobility out of FTCs and TAW, they again seek to draw a distinction between the two. They argue that the transition from a FTC to a permanent contract is relatively frequent in Germany and in particular for young people entering the private sector for whom FTCs – abstracting from apprenticeships – are to be seen as an extended probationary period, also noting that their continuous renewal is widespread in the three sectors noted above where specific conditions prevail. (Different rules obtain for FTCs implemented with and without cause; that is, where the employer either provides or does not provide 'objective' reasons for their deployment; see the Legal Appendix in Addison et al. 2018: 26-27). Mobility from TAW to permanent direct employment is stated to be more problematic given the concentration of agency work among basic occupations and in firms subject to restructuring, leading Eichhorst and Tobsch (2013: 21-22) to refer pessimistically to the "distinct institutional arrangements and functional logic of agency work in Germany." The authors, who subscribe to a shrinking core model, duly see the policy issues as different in kind. For FTCs, the main problem is seen as the reluctance of public sector employers to convert these temporary jobs into permanent jobs because of the near impossibility of firing civil servants and public employees with tenure. For its part, the problem of TAW is viewed as akin to that of marginal part-time work, albeit one with a very different solution: re-regulation and a heightened influence of collective bargaining. As a practical matter, we note that by the end of our sample period and beyond there are indeed indications of a shift back towards re-regulation (see Addison et al. 2018).

Other authors while also preserving the distinction between the two forms of temporary employment have offered a rather different pro-productivity diagnosis. Thus, for example, drawing on the fact that use of TAW in Germany is high by European standards (see Hirsch 2016: 1192), one explanation has centered on the high matching efficiency of the temporary help sector vis-à-vis the public employment service (Neugart and Storrie 2006). Another is the comparatively recent finding of a strong positive effect of TAW on productivity; or, more accurately, a robust hump-shaped relation between intensity of use and firm productivity. Specifically, using seven waves of the IAB Establishment Panel for the years 2003-2009, Hirsch and Müller (2012) report maximum productivity effects occurring at agency temp employment shares of between 7.5 and 15% across OLS, fixed effects, and system GMM estimators. For their preferred specification, establishment gross value added peaks at 14.2% at a temp share of 11.3%. As Jahn and Rosholm (2018: 8) note, these results are consistent with the notion that the tighter regulation of the other type of contingent employment considered here, namely FTCs, has incentivized user firms to use agency temps to adapt their workforce to changing economic conditions. (They contend that FTCs play a minor role in securing flexibility for German firms unlike the situation in other countries such as southern European nations.) FTCs, so the argument runs, are primarily screening devices promoting good job matches between workers and firms. And indeed there is some real indication that German such contracts do offer a pathway to permanent employment, particularly in those circumstances

where the normal probationary period for regular employment offers insufficient time to assess the quality of the match, as might often be the case for university graduates (Boockmann and Hagen 2008). That said, even if a little over one-half of FTCs are typically converted into permanent contracts, the fact remains that they likely fulfill in part a secondary labor market function as well with some incumbents encountering a risk of repeated unemployment. Accordingly, a more balanced reading would be that FTCs are 'less contingent' than is TAW – which interpretation is not to deny that strict dismissal protection in Germany might mean that screening considerations are also relevant for (some) less skilled workers too (see Hirsch and Müller 2012: F219).

Even if firms did not use TAW as a screening device, so that productivity benefits did not accrue from this source, there are other routes to productivity gain from using temps. Thus, and most familiarly, TAW allows firms to meet variability in demand, to buffer their regular labor markets during downturns, thereby allowing them to sustain their internal labor markets. And of course gains in productivity would also accrue to the extent that firms do use temps as a screening device in circumstances where such workers have a greater incentive to exert effort than most permanent employees. Nevertheless, to the extent that FTCs provide a secondary market, there is some scope for viewing each type of temporary employment in similar light. Bryson (2013) has also suggested that positive productivity effects might arise where temps are potential substitutes for regular workers, on this occasion serving to motivate the latter to improve their productivity to forestall their replacement. This is an alternative to the complementarity argument for greater productivity stemming from the buffering of regular employees during times of demand uncertainty, or by allowing regular employees to focus on core activities where they enjoy a comparative advantage. The pro-productivity argument(s) have stimulated German research to investigate whether the use of agency temps increases or decreases the employment stability of permanent employees – on which, see the differing empirical findings of Hirsch (2016) and Pfeifer (2005). By the same token, Bryson has countered that TAW may lower productivity where temps are less committed to the firm, have lower job satisfaction, or have unintended spillover effects on regular employees, lowering their morale and commitment to the firm.[3]

Theoretically ambiguous effects of temporary employment on productivity are the takeaway from this discussion, and we have yet to broach in any detail the subject of workplace representation and collective bargaining. To get one step closer to the role of this different set of institutions we now turn to two non-German studies that directly examine labor organizational influences on temporary employment**.** Each seeks to accommodate some disparate findings of earlier institutionalist treatments while also directly informing our own empirical inquiry. In the first study, Salvatori (2009) uses the Establishment Survey on Working Time and Work-Life Balance (ESWT) for 2004/2005, covering 21 EU nations and a sample of more than 21,000 workplaces. Salvatori's estimates point to a positive association between union presence and the probability of the workplace having employed FTCs and TAWs at some time in the 12 months preceding the survey, even after allowing for the endogeneity of union status. That said, he cautions that this result could arise from a buffer effect (benefitting core workers) or alternatively stem from the actions of employers seeking to undermine the union strength in collective bargaining (see below). Note further that 'unions' in this study encompass any form of workplace representation, and so include works councils as well as unions per se, and that the results fracture when collective bargaining is conducted at levels higher than the workplace or organization.

The finding of a positive association between unionization and temporary employment is also reported in an innovative study by Devicienti, Naticchioni, and Ricci (hereafter DNR) (2018), which is notable for its recognition and interpretation of the interplay between unions and product market volatility and in distinguishing between different types of FTCs. Using Italian firm-level data for 2005 and 2007, the authors estimate OLS, IV, and FE models regressing a firm's propensity to use fixed-term contracts on product market volatility, presence of a union at the workplace, the interaction between volatility and union presence, and a set of controls that include labor force composition and firm age, and dummies for firm size, sector, and region. Volatility is computed as the average standard deviation of log sales over the period 1997 to 2005, calculated at the three-digit industry level. In the IV models, workplace unionization is instrumented with the two-year lagged mean unionization at the industry and regional level.

Results of the OLS model for the most parsimonious specification containing volatility and union presence indicate that the former is positively and the latter is negatively associated with the use of fixed-term contracts, which might suggest that greater volatility encourages firms to employ these temporary workers so as to facilitate the adjustment of the labor input, while unions for their part seek to counter such moves to avoid any dilution of membership and union authority. However, in the next iteration the interaction term is negative and statistically significant while the coefficient estimate for the union term is no longer statistically significant, instead suggesting that union impact is bound up with uncertainty. The corresponding IV estimates confirm the volatility result for the parsimonious equation (but the union effect is now insignificant), while fuller specifications corroborate the finding of a negative interaction term between volatility and unions while pointing to a significantly positive union coefficient estimate. The baseline FE model is quite consistent with the previous baseline results for volatility and the now very small union coefficient estimate can be interpreted as implying that when the interaction term is omitted the union effect becomes small and insignificant as it picks up average volatility, meaning that at low (high) volatility the union effect is positive (negative).[4] When the interaction term is duly 'added back' all the previous effects obtain.

In a final empirical application, the authors estimate the IV and FE variants of the model across two distinct types of FTCs, namely training contracts and those not offering training. For nontraining contracts all the previous results obtain. In the case of training contracts, however, none of these arguments plays a role. The authors argue that in the presence of a core labor force that enjoys a high level of employment protection, firms will not seek to deal with a volatile market environment by offering difficult-to-amortize training contracts. For their part, unions are seen to have an interest in some level of nontraining contracts that act as a buffer stock and protect permanent workers to some degree addition, whereas training contracts cannot act as a buffer stock. In addition, firms may see in these cheaper contracts some protection against aggressive unions.

The authors see their results as offering a framework capable of explaining disparate results reported in the literature on unions and temporary employment. To repeat, the key is the interplay between unions and volatility. Unlike volatility, which has a positive effect on FTC employment, the union effect is not transparent. Rather, it depends on the degree of volatility, different degrees of which are capable in principle of explaining the different effect of unions reported in treatments that exclude the volatility argument.

Now the German industrial relations system clearly differs from those evaluated in these two econometric studies. It is still broadly characterized by collective bargaining at industry or branch level and worker representation through works councils at establishment and company levels. If we insert into this setting the broader position taken on unions by the literature – to the effect that they represent permanent workers and use their bargaining strength to increase the wages/expected firing costs of permanent workers – the implication is that national unions will be sensitive to the depletion of union power occasioned by the use of temporary employment. Works councils may respond more favorably to the inevitable demand of employers to use more temporary employment. Here we might add the caveat 'under sectoral agreements,' as research has suggested that even in circumstances where levels of mutual trust are high, German works councilors unlike employers have seemingly shown only a marginal preference for decentralized bargaining (see Nienhueser and Hossfeld 2011). If we now introduce uncertainty into this mix, one encounters the familiar argument that temporary workers are a peripheral buffer for the core of permanent workers. However, we would expect the acceptance by workplace representation of actions in defense of the core to be conditioned by union attitudes toward trading off bargaining power for employment stability.

However, if at the outset one abandons the view that the nature of employment relations is adversarial and enters a world of incomplete contracting, an efficient governance apparatus engaging unions as a central player may eschew temporary contracts under normal circumstances. One aspect of this cooperation may be wage moderation and/or greater internal employment flexibility. So local unions/works councils may be associated with less atypical work because segmentation of the internal labor market damages worker cohesion and serves to frustrate the cooperative industrial relations solution to the standard problems that attach to incomplete contracting, namely the incentives that exist ex post for the parties to break contractual commitments made ex ante. In this scenario, then, we would observe a negative relation between local unions/works councils and temporary employment.

From the perspective of this cooperative industrial relations model, any tendency on the part of covered firms to have greater recourse to temporary employment in the face of increased uncertainty is generally assumed to be less than in nonunionized firms. If this is the case, the periphery is of secondary importance throughout and the efficient contracting model deviates from its core-periphery counterpart in predicting a (consistently) negative relation between local unions/works councils and temporary employment. However, ambiguity surrounding the union effect persists because we do not know the reach of continuity labor markets and their sensitivity to change.

Yet we would argue that progress has been made in integrating uncertainty in empirical applications. For DNR, as we have seen, product market volatility assumes center-stage. Here the argument is that the effect of local unions (and necessarily other forms of workplace representation as well) will likely hinge on product market volatility. In particular, volatility adds an element of heterogeneity into the impact of unions on a firm's desire for temporary employment, such that a generally positive effect of workplace unions on the use of temporary employment contracts morphs in the presence of heighted uncertainty/volatility to a negative association. This at least is the prediction of the standard core-periphery model, and for DNR is also expected for continuity markets as well.

This returns us to potential differences in the two types of temporary work contract even if few individual studies have jointly examined the correlates of each. Given that fixed-term contracts achieve a number of roles other than short term filling in, as it were, we might expect real differences in the results for the two types of temporary contract, even if there is some modest evidence in the literature of complementarity in their deployment (Pfeifer 2005: 414). By analogy with DNR's training contracts, FTCs are not expected to be used in any substantive measure to offer protection to the core of permanent workers. Further, to the extent that they are used for this purpose, there is the suggestion that they will be a smaller threat than TAW to a union at least as their incumbents will likely engage in more union activity and join unions. At first blush it may also be tempting to argue that changes in the intensity of use of FTCs and TAW will be *directionally* the same in circumstances where works councils are buffeted by increased product market volatility. However, to the extent that such entities might eschew the use of TAWs in normal times by reason of their lower skill levels and experience they may nonetheless have to embrace them in extremis to protect the survival of a *shrinking* core. On the other hand, a secular shrinking core allied to deskilling and organizational transformation is unlikely to characterize the large majority of establishments hiring workers under FTCs.

In the light of the above, it would be idle to pretend that theory offers settled predictions regarding the effects of worker representation on the use and intensity of use of TAW and FTCs. Despite its ambiguities, however, the literature is highly informative of the arguments appropriate to any such inquiry, while suggestive of patterns of association in the data and, as we shall see, potential improvements in model specification.

III. The Data

In this study we employ the IAB Establishment Panel, which is a large-scale representative survey dataset of establishments in Germany sponsored by the Institute for Employment Research (IAB). The IAB Establishment Panel has been available since 1993 and comprises some 15,000 to 16,000 establishment interviews per year. It provides detailed information on the demand side of the labor market as of the reference date (i.e. June 30 in each year); in particular, concerning the structure of the establishment's workforce, labor turnover, business policies (including investment and training), and performance. Apart from its strong panel dimension, with a yearly continuation response rate of over 80 percent, new establishments enter the survey in every wave to both compensate for non-responses/panel mortality and to mirror firm dynamics (i.e. births and deaths). For a more detailed description of the IAB Establishment Panel, the reader is referred to Ellguth, Kohaut, and Möller (2014).

In order to shed light on the different aspects of the relationship between industrial relations institutions and the employment of fixed-term and agency workers we select five separate outcome variables. The first is the number of TAWs employed by an establishment (Y_1), the second is the corresponding number of FTC workers (Y_2), while the other three dependent variables exploit additional information only available for FTCs. They comprise the number of workers with a FTC among the new hires (Y_3), the number of workers with a FTC that transition into permanent employment (Y_4), and the number of workers whose FTC is renewed (Y_5). Outcomes Y_3 through Y_5 are flow variables pertaining to the first half of the year (i.e. observed from January to June), whereas Y_1 and Y_2 are stocks measured at the reference date (i.e. June 30). For most of our analyses,

we shall employ an unbalanced panel covering the years 2006 through 2015, with the exception of variable Y_5, for which the required information is only available from 2009 to 2015. Only establishments with at least 5 employees are included in our estimation sample. We further restrict the sample to privately-owned, for-profit organizations, by eliminating from the raw sample all those establishments that are either publicly owned or report a budget volume when asked about their sales revenues.

The labor institution variables are flagged by 1/0 dummies indicating whether there is a works council, a sector-level collective wage agreement, or a company-level collective wage agreement. (Additional labor organizational variables will be deployed in our separate sensitivity analysis.) Throughout our investigation, the presence of a works council will be interacted with product demand volatility, drawing directly upon DNR (2018). This variable is, for each year and for each industry, given by the average standard deviation of establishment log sales. Specifically, $volatility_i = (\frac{1}{N_i - 1}\sum_{e=1}^{N_i}\{\log(sales)_e - \overline{\log(sales)}_i\}^2)^{1/2}$, where the subscripts e and i denote establishment and industry, respectively, and N_i is the number of establishments in industry i (subscript t omitted). To further reduce the possibility of potential endogeneity of the volatility variable, we take the average of the past 6 years, so that the demand volatility measure in year t is the average over *t-1, t-2, …, t-6*. Observe that the use of an average over an industry and not the establishment's own sales is also helpful in this regard. The sample comprises a total of forty-three 3-digit industries, which are then aggregated into 19 industry dummies.

Our set of control variables includes workforce composition (namely the share of women, part-time workers, employees hired for simple tasks that do not require any vocational training, and employees hired for complex tasks that require either a vocational training certificate, a corresponding measure of professional experience, or a university or college degree) and the sum of gross wages. In addition, dummies indicating whether competitive pressure is reported to be high, some fraction of the output/sales volume is exported, parts of the establishment's activity have been outsourced, and whether the technical standard of the capital stock is either excellent or good (versus either rather poor or completely outdated) are deployed, as well as measures of establishment age, size, industry affiliation, and location. Finally, some specifications also control for the establishment's hiring rate (defined as the number of hires divided by the total number of employees), the employment share of FTC workers, and the proportion of employees who received further training during the first six months of the year.

A full description of the variables and the corresponding means are given in Table 1. We briefly comment here on the main descriptive statistics of the selected outcomes (Y_1 to Y_5) for the entire sample and for the separate cases of establishments with and without works councils. By construction, all (unweighted) means are calculated at establishment level. On average, an establishment employs 5.72 TAWs and 9.62 workers with a FTC. From January to June, we also observe 3.59 new hires with a FTC, 3.00 workers whose FTCs were converted into permanent employment, and 2.47 workers with a FTC renewed in the same interval. On average, in works council establishments there are 17.79 temps and 22.26 FTCs, as compared with 0.97 temps and 4.67 FTCs in establishments without works council. Seemingly, new FTC hires, FTC transitions, and FTC renewals are also higher in the sample of works councils, at 7.36, 4.17, and 3.26, workers respectively. The corresponding values in plants without works councils are 2.13, 1.95, and 1.78.

These are unconditional means without at this stage controls for other relevant establishment characteristics.

[Table 1 near here]

IV. Modeling

We employ a zero-inflated negative binomial (ZINB) model to analyze the determinants of the selected discrete response variables $Y_{ji}, j = 1, 2, \ldots, 5$. In this framework, subscript j denotes, respectively, the number of TAWs (Y_1), workers with a FTC (Y_2), new hires with a FTC (Y_3), FTC conversions into permanent work (Y_4), and workers whose FTC has been renewed (Y_5) per establishment *i*. Again, the time subscript is omitted to simplify the notation.

A key aspect of this modeling strategy is the presence of two underlying data generation processes. In the case of agency temps (Y_1), for example, this means that on the one hand we have a process explaining an establishment's *participation* in the hiring of temps and on the other, given the probability of its being a *participant*, an alternative process determining the *extent* of its usage or subsequent probability of using *k* (integer) temps, *k = 0, 1, 2, …, m.* This approach offers the possibility of separating the so-called certain (or excess) zeros – defined as the group of establishments for which the count is expected to be zero – from the alternative group of potential users for whom any non-negative count is possible.

Clearly, the ZINB offers a better fit to the data than an ordinary least squares regression: firstly, because there is a mass of zeros in the observed count; and, secondly, because the outcome variable is necessarily censored (non-negative). In turn, the ordinary Poisson model (or the negative binomial) does not tackle the issue of *endogenous participation*; that is, it does not distinguish the group of absolute zeros from the rest (i.e. the group of zeros 'by choice'). As shown in the next section below, the relative frequency of zeros in our dataset is around 80%, raising concerns that a non-zero inflated model has the potential to introduce confounding factors that will bias the estimates. Using the ZINB model we will therefore examine the role of industrial relations institutions both at the extensive (participation) and intensive (use) margins, with respect to any of the selected response variables.

Formally, and for illustrative purposes using the zero-inflated Poisson (ZIP) case,[5] the response variables Y_{j1}, Y_{j2}, …, Y_{jn} follow a binary process in which, for each $j = 1, 2, \ldots, 5$, we have $Y_i \sim 0$ with probability p_i and $Y_i \sim$ Poisson (λ_i) with probability $(1 - p_i)$ so that $Y_i = 0$ with probability $p_i + (1 - p_i)e^{-\lambda_i}$, and $Y_i = k$ with probability $(1 - p_i)e^{-\lambda_i}\lambda_i^k/k!$, $k = 1, 2, \ldots$ (see, for example, Lambert 1992). In practical terms, the logistic regression explains participation based on a set of covariates *A*, followed by a count model with covariates *B*. In principle, there will be little prior information on the role of covariates in the *A* and *B* subsets. It is therefore possible to have a situation in which, say, a given covariate generates both higher participation and less intensive use, or conversely. In our case, the same set of regressors will be exploited in both decisions. The set of proposed statistical tests will then shed light on the relevant empirical hypotheses.

Although the ZINB and ZIP models address the issue of endogenous participation, in the sense that each of them tackles the difficulty arising from the possibility that the observed zeros in the count model may come from two quite distinct groups, there remains the issue of endogenous treatment at the intensive margin. One possibility is that a works council establishment may have unobserved characteristics that generate both participation *and* intensity (that is, the number of temporary employees in the establishment). As we lack any good instrument to control for the possibility of endogenous treatment, and the instrumental variable approach in the context of zero-

inflated models is unchartered territory, we will discuss the robustness of the ZINB results by experimenting with observables that may predetermine the works council and/or collective bargaining status. To this end, we will first examine, across different groups, some descriptive statistics on the reasons why establishments hire TAWs and the corresponding occurrence of human resource management practices. Next, we will complement this inferential analysis by introducing alternative measures of unionization into our ZINB model, even if data constraints compel us to utilize a single cross-section for 2010 rather than the pooled 2006-2015 data.

V. Findings

We begin by describing the pattern of our selected outcome variables over time. Observe firstly from panel (a) of Figure 1 that between 85 and 90% of all establishments do not employ any TAWs at all. This share is comparatively stable over time, although the trough in 2009 suggests that temps may have been deployed as a buffer stock in the face of demand volatility. For users, the share of temporary work is also rather flat over the period at around 8 to 9%.[6]

[Figure 1 near here]

A more detailed profile of the utilization of workers on fixed-term contracts is given in the remaining three panels of Figure 1. Panel (b) shows that, for establishments with new FTC hires, an extremely high percentage of new hires are FTC workers, at approximately 80% of the total. Given that user establishments (i.e. establishments in which the new hires have a FTC) comprise less than 60% of the total, the implication is that the overall incidence of FTCs among new hires is below 50% (see the continuous line at the bottom of the panel).

Over the course of the sample period the transition from a FTC into an open-ended contract, shown in panel (c), is also slightly increasing and currently stands at roughly 50% (in the subsample of establishments with at least one FTC conversion). But a relatively small percentage of users actually convert their FTCs into open-ended contracts – they comprise approximately 20% of all establishments with FTC workers. Lastly, for the shorter 2009-2015 interval, information on the rate at which FTCs are renewed is shown in panel (d) of the figure. In common with the previous time-series, we have the result that the course of renewals is very flat over time, amounting to approximately 40% for establishments with at least one FTC renewal.

We now turn to the frequency distribution of the five outcome variables, Y_1 through Y_5, in Table 2. Clearly, for the entire sample, there is a mass of zeros that in conjunction with the long right tail suggests (unconditional) overdispersion. Indeed, between 53.5% (in the case of the number of FTCs that transition into permanent employment, Y_4) and 80.9% (in the case of the number of TAWs, Y_1) of all establishment-year observations have a count equal to zero, with the number of counts greater than zero decreasing quite rapidly for all response variables. For example, in the case of Y_2, the number of zeros (i.e. those situations in which establishments are non-users of FTCs) accounts for 57.5% of the total. The percentage of establishments reporting a number of FTCs greater than zero and less than 10 is 26.8%, while for the following class of 10-50 FTC workers it decreases to 11.5% of the total. This pattern holds for all the other response variables as well. Based on Table 1, it is also clear that the variance is much larger than the mean.[7]

[Table 2 near here]

As discussed in section IV, our empirical analysis relies on a zero-inflated negative binomial model. Estimates of the model are provided in Table 3. For all five outcomes, Y_1 through

Y_5, a common set of regressors is deployed for both the count and logit components of the ZINB model, with exception of columns (3) through (5) where the share of FTC workers (and the hiring rate in the case of outcome Y_3) is also introduced into the model.

[Table 3 near here]

Beginning with the results in column (1) of the table, note that for the logit the dependent dummy variable is defined as 1 if the number of TAWs in a given year is zero and 0 if there is a strictly positive number of temps working in the establishment. The logit model thus explains the determinants of not having any temps at all, whereas the count model explains the number of temps. Summarizing, the existence of a works council does not appear to be decisive in defining user/non-user status. Among users, however, works councils per se seemingly mitigate the number of temps (if volatility is zero), while cet. par. a higher demand volatility tends to reduce it in the absence of a works council although the correlation is only marginally significant. These are after all expected results. But the positive interaction term implies that the mitigating works council effect disappears when volatility increases. In order to clarify this effect, we plot the predicted outcome Y_1 over the range of our demand volatility measure, splitting the full sample into establishments with a works council and without a works council, with all other covariates set at their corresponding sample mean.[8] As can be seen from panel (a) of Figure 2, the predicted number of TAWs increases when a works council is present and decreases when it is absent. The indication is therefore that in order to protect the core workforce from demand shocks, works councils may be more likely to agree to form a cushion of such temporary workers when volatility is high. In absolute size, the magnitude of the effect is less than 1 agency temp over the range of observed volatility. In the absence of workplace representation, establishments are likely to be less constrained in their decision making and less dependent on TAWs in input adjustment.

[Figure 2 near here]

The pattern regarding the extensive and intensive use of workers with FTCs shown in column (2) of the table is distinct. First, we do not report statistical significance for any of the labor institution variables in the logit model, which means that the use or non-use of FTC workers is fully determined by our fairly extensive set of control variables (industry affiliation and establishment size, inter al.). We note parenthetically that the null of the negative binomial (NB) versus ZINB is clearly rejected by the data. This means that the zero-inflated model is indeed better suited for the data. (Discussion of the diagnostic tests is given below.) Second, and more as expected a higher volatility of output demand increases the number of FTC workers in the absence of a works council. Third, works councils are nevertheless associated with a decreased labor adjustment at the margin through FTCs when volatility increases. Again, to best illustrate this result, we plot in panel (b) of Figure 2 the predicted Y_2, following the procedure described above. As can be seen, the absolute magnitude of the effect is larger in non-works council establishments than in establishments with works councils. Observe that in the presence of works councils high demand volatility is associated with lower use of FTCs. Interestingly, in both panels of Figure 2 the pattern is virtually linear with no evidence of any change in works council behavior across the different levels of demand volatility.

For the logit model given in column (3) of the table, establishments with a works council are marginally more likely to apply a FTC in respect of at least one of their new hires. For users, both high demand volatility and the presence of a works council are associated with a greater

number of FTCs among new hires at a very high level of statistical significance, which suggests that these contracts can play two roles: screening and a labor input adjustment mechanism. The interaction term is negative, as in column (2), but the actual implication is that for both works council *and* non-works council establishments higher volatility is associated with a greater number of new hires with a FTC. For parsimony, we do not present the plots for the predicted outcome Y_3 over the range of demand volatility measure in Figure 2 but they are available upon request.

A related issue is the transition from a FTC to a permanent contract with the firm. The results in column (4) of the table suggest that establishments are more likely to opt for this strategy both at the intensive and extensive margins whenever a works council is present, although the statistical significance is clearly weaker than in the previous columns. The coefficient of the interaction term is negative and produces the expected reduction in the number of transitions as volatility increases for works-council establishments. Not surprisingly, a higher share of trained workers is positively associated with a higher number of FTCs being converted into permanent, open-ended contracts, but not at a statistically significant level. More surprising perhaps is the positive coefficient of the training variable in the logit, as it suggests that the higher the share of trained workers, the greater is the likelihood that the firm will not convert fixed-term contracts into permanent contracts. More in accordance with our priors, is the result in column (5), that a higher training share reduces the number of FTC renewals, while impacting positively the chance of a firm refraining from this policy in general (the coefficient is negative in the logit). Works councils in turn seem to favor to the use of FTC renewals (significant at the 5% level), but no impact is detected on the intensive margin. Neither demand volatility per se nor its interaction with the works council variable is statistically significant in the count model.

Note that all the diagnostic tests reported at the base of Table 3 perform according to our expectations. First, the hypothesis of overdispersion is confirmed because the null (i.e. alpha=0) is comfortably rejected in all five columns of the table. There is therefore no empirical evidence to suggest that an ordinary Poisson count model would be the appropriate regression vehicle. The second diagnostic is provided by the Voung test that compares the null of an ordinary negative binomial model with a zero-inflated negative binomial. Again, the null is easily rejected. Finally, in comparing the ZINB and ZIP models, the corresponding likelihood ratio test comfortably rejects the null that the latter offers a better fit than the former.

We next provide some robustness tests for establishment size, given that the legal rights of works councils are defined according to certain size thresholds (Addison 2009: 16-19). Specifically, we want to test whether our results hold for the subsets of establishments with 21 to 100 and 21 to 249 employees. In the interests of economy, results for just the latter subsample are given in Appendix Table 1 (findings for the former sample are available upon request). Despite the material reduction in sample size, the results for this subset very much resemble those reported earlier in Table 3. That is, we again find that works councils are positively associated with new hires with a FTC and negatively with the number of TAWs. Demand volatility and its interaction with the works council variable also maintains the same signs throughout (viz. Y_1 to Y_4). Further, and by way of illustration, we can also confirm that high volatility is associated with a lower use of FTC workers in works council establishments (see Addison et al. 2018: Appendix Figure 1).

According to Table 3, sectoral agreements are seemingly associated with a non-use of TAWs (in the logit equation), while their role in this regard for the remaining outcome indicators

is statically opaque. In the count model, sectoral agreements are associated with a lower number of FTCs and a reduction in new hires with a FTC.

To further clarify the role of collective bargaining and workplace representation, we decided to include a sectoral agreements-works council interaction term in our ZINB model estimates. In the interests of transparency, and given the largely unexplored relation between works councils and local collective bargaining (see section II), we excluded all firm-level collective agreements. That is, we next focus on the sample of establishments with sectoral agreements and without collective agreements of any kind. Appendix Table 2 replicates Table 3 for this reduced sample of establishments. We confirm the finding from Table 3 that sectoral agreements seemingly militate against the use of TAWs, while the association is exactly the opposite, albeit insignificant, for stand-alone works councils. Among users of temps, the signs of the two coefficient estimates are maintained, and on this occasion the coefficient estimate for works council presence is now weakly statistically significant. The new interaction term in turn shows that the joint presence of the two entities is associated with a reduced number of TAWs. No statistically significant such relationship is found for Y_2. The interaction term achieves significance for Y_3, its negative sign indicating that the two institutions are associated with a reduced number of new hires with a FTC.

V. Further Testing

Finally, we exploit some additional data to further clarify the determinants of the employment of FTCs and TAW. Ideally, the analysis using this enhanced information should be performed for the entire 2006-2015 sample period. Unfortunately, the supplementary data in question are available for just one year, with the result that our tests are perforce based on a single cross section for 2010.

The first new element offers a broader sample characterization of the hiring of TAWs, using the unique information from question 49 of the 2010 IAB survey, which inquires of establishments their most important reason for hiring agency temps in the preceding two years. From a descriptive point of view, we wish to ascertain whether there is any discernible pattern linking works council status and, say, 'demand uncertainty,' here defined by the answers A (i.e. 'fast availability of required labor'), B ('duration of assignment is expected to be short'), and D ('uncertainty about economic prospects'). The other reasons for hiring temps are either grouped into items E and F or C and G, descriptions of which are given in Table 4.

[Table 4 near here]

As shown in the table, *demand uncertainty* is indeed crucial to understanding TAW. In approximately 90% of the cases, either A, B, or D is reported as the most important factor in hiring decisions. This is not at all surprising given the regression results in Table 3, where our proxy for output demand volatility plays a key role. Perhaps the main point to be taken from Table 4, however, is that there is no obvious pattern connecting the reasons for TAW with works council (or collective bargaining) status. In short, any unobserved factors associated with the reasons why establishments are hiring temps do not seem to vary materially with the labor institution variables.

A second issue pertains to human resource management (HRM) practices. At stake is the possible relationship between certain HRM practices and labor institutions, one conjecture being that these practices ultimately have the potential to impact worker representation through works councils and collective bargaining. If, for example, a given type of HRM practice results in less need for worker representation at the plant level and at the same time has an impact on the

deployment of temporary workers, omission of the argument can bias the regression results. To examine the issue, we again make use of the new information contained in the 2010 survey. Specifically, question 29 asks which of 10 practices were the most important changes implemented at the establishment in the last two years. We selected the items 'downward shifting of responsibilities and decisions,' 'introduction of team work/working groups with their own responsibilities,' and 'improvement of quality management' as indicators of the presence of HRM practices. Table 5 gives the corresponding percentage of establishments in which these practices are considered dominant (i.e. the most important). Among the 10 items the incidence of these three particular practices is quite sizeable: in 21 to 24% of the cases, establishments identified one of the three items as the most important change to have taken place over the two-year interval. Observe that the evidence also suggests that the incidence is virtually the same across works council and collective agreement groups. On this basis, any HRM practice omitted in Table 3 does not seem to be associated with any particular labor institution in any obvious manner.

[Table 5 near here]

A separate issue is whether the omission of any measure of unionization is also likely to be damaging to our findings in Table 3. Since unionization may be correlated with works council and collective bargaining status on the one hand and the outcome variable on the other, omission of a unionization variable might be a confounding factor. Introducing some measure of *unionism* might therefore allow us to offer an improved causal relation.

We note that in the context of the ZINB model specified in Table 3, an ideal solution would be to select a relevant instrument from the IAB Establishment Panel. However, not only is there no information on trade union density in the survey but also, to our knowledge, no possibility of implementing an IV approach within the framework of a zero-inflated negative binomial model. Rather, our approach will instead amount in the first instance to deploying (lagged) sector-level union density information, extracted from the 2009 European Company Survey (ECS), and then re-running the models specified in Table 3. Given that the information on trade union density pertains to 2009, this part of our analysis is again confined to the 2010 cross-section.

In this final exercise, we first replicated the model specification in column (1) of Table 3 for the year 2010. We then introduced in two separate regressions (a) the trade union density argument from the ECS, and (b) two alternative indicators of unionism, namely the sectoral mean incidence of industry-level and firm-level agreements, both of which variables were based on IAB survey material. Summarizing briefly the results of this exercise, which are available upon request, we found that although the 2010 results were statistically weaker, the two samples (i.e. the 2010 cross-section and the 2006-2015 pooled data) yielded not dissimilar results. Moreover, our model results were not sensitive to the introduction of the union density argument, suggesting that there is little evidence to indicate that omission of the variable biases our results in any obvious manner. Finally, the inclusion of the *proxies* for the unionization measure produced yet weaker results. But again there was no indication that, despite the limitation introduced by the strong reduction in sample size, unobserved characteristics connected with unionization were driving the results obtained in Table 3 in any overt way.

VI. Concluding Remarks

This study has provided a comprehensive analysis of the use of temporary employment, both at the extensive and intensive margins. It distinguishes between fixed-term contract workers and temporary agency workers in Germany over a period of one decade, starting in 2006. It should be recalled that even though these groups constitute a modest share of the total workforce, they have often been important sources of all new job creation in the post-Hartz years.

In a new departure, our analysis has applied a zero-inflated negative binomial model to the data to reflect the obvious but often ignored fact that most establishments are non-users of fixed-term contracts or temporary agency workers. Motivated by this empirical regularity, we sought to investigate the potential effect of two key labor institutions – works councils and collective agreements – on the use and intensity of use of temporary employment over the sample period. Our approach involved looking at separate but connected outcomes, namely two stocks (the number of TAWs and workers with FTCs observed at a given point in time in each year) and three flow variables associated with FTCs (the number of new hires with a fixed-term contract, conversions of fixed-term contracts into regular employment with the firm, and the extension or renewal of fixed-term contracts), calculated over a six-month interval in each year. Given the cross section nature of our data, we also undertook a number of robustness checks and conducted a further examination of possible confounding factors.

Among our principal findings for the stock dependent variables are the following. First, we find strong statistical support for the ZINB model. Second, from the perspective of adjustment at the extensive margin, there is little indication that our labor institution variables are correlated with the use/non-use of either type of temporary work, especially in the case of fixed-term contracts. Third, collective bargaining has different 'effects' on (strictly, associations with) the intensity of use of temporary employment: sectoral agreements are associated with reduced intensity of use of workers with FTCs, while firm-level agreements are associated with more intensive use of TAW. Fourth, greater product market volatility per se does not display a unique relation with temporary employment: a positive correlation can only be found in the case of the number of workers with FTCs. Fifth, and potentially most important of all, is the covariation between the number of temporary employees and the interaction between works councils and product market volatility. In this case, our simulation exercise using the demand volatility measured over its entire range indicates that, all else constant, the use of TAWs (workers on FTCs) is predicted to rise (decline) if volatility increases whenever a works council is present. The reasons for the latter set of findings are not transparent and require further examination. If anything on the assumption that TAW offers greater flexibility in meeting product volatility than FTCs, which we suggested earlier may function more as a port of entry, we might have expected the results obtained for FTCs to be more applicable to TAWs. One possibility is that works councils may tolerate increased use of agency temps in extreme circumstances when the very survival of the core is at stake, whereas increased use of workers with FTCs in such circumstances might be viewed as more adversarial in nature.

The *noncomplementarity* of the two types of contracts emerges as perhaps the hallmark of this study. The parallel ZINB analysis of the correlates of three FTC flow variables also favors this interpretation.

Endnotes

1. However, to anticipate our emphasis upon the cycle, see the most recent German study on the issue by Jahn and Rusholm (2018), who argue that the mixed effects reported in the literature on the role of temporary employment as a stepping-stone to regular employment reflect the strong cyclicality of the demand for such workers, leading to (counter) cyclicality in the stepping-stone effect as well.

2. That said, in circumstances of strategic intensive use of temps by management (see Holst, Nachtwey, and Dörre 2009), works councils and labor unions have sought to cap the number of agency temps that may be sent to the user company. Relatedly, some collective agreements have required the automatic hiring of temps as permanent employees after some interval (see, for example, Schild and Petzold 2009).

3. Bryson's (2013) own investigation of temporary agency workers uses British WERS data. He reports that the presence of agency temps exhibits no well-defined association with (three measures of) labor productivity. However, there is a strong positive association with financial performance and a negative association between the presence of temps in the employees' occupation and wages in that occupation. Although he cautions against a causal interpretation, Bryson's results are more supportive of a *segmented labor market* in which TAW adversely impacts employees' work experience.

4. The authors compute the union effect at different values of volatility. Their IV results for the fullest specification indicate that unions increase the proportion of workers with FTCs by 2.7 percentage points when volatility is low (viz. at the first decile of the volatility distribution), that the union effect is to all intents and purposes zero if volatility is at the median, and that it becomes -5.1 percentage points when volatility is high (viz. at the 90^{th} percentile). Parallel results are obtained when using the FE estimates.

5. The ZIP model is rather less cumbersome than the corresponding ZINB and is offered here for didactic purposes only. As will be shown below, the ZIP model is easily rejected against the ZINB alternative in our data.

6. Comparable figures using weighted data are available upon request. They show the same pattern over time. Only the scale is different, in that establishments with at least one temp, one new hire, one FTC conversion, and one FTC renewal – panels (a) through (d), respectively – are over-represented in the unweighted data.

7. The observed overdispersion suggests that OLS regression cannot be an adequate modeling tool. Indeed, by comparing actual frequencies with those fitted frequencies it is clear that the ZINB model best fits the data, plainly outperforming the OLS (and PROBIT) cases. As a matter of fact, for all outcomes the difference between the predicted and the actual frequency is always less than 1 percentage point in the ZINB case (see Addison et al. 2018: Table 3).

8. We are indebted to an anonymous referee for suggesting this approach, which proved to be a suitable procedure to evaluate the impact of the interaction term given the non-linearity of the ZINB model (see Ai and Norton 2003).

References

Addison, John T. 2009. *The Economics of Codetermination – Lessons from the German Experience.* New York: Palgrave Macmillan.

Addison, John T., and Christopher J. Surfield. 2009. "Atypical Work and Employment Continuity." *Industrial Relations* 48(4): 655-683.

Addison, John T, Paulino Teixeira, Philipp Grunau, and Lutz Bellmann. 2018. "Worker Representation and Temporary Employment in Germany: The Deployment and Extent of Fixed-Term Contracts and Temporary Agency Work." IZA Discussion Paper No. 11378. Bonn: IZA Institute of Labor Economics.

Ai, Chunrong, Edward C. Norton. 2003. "Interactions Terms in Logit and Probit Models." *Economics Letters* 80: 123-129.

Boockmann, Bernard, and Tobias Hagen. 2008. "Fixed-Term Contracts as Sorting Mechanisms: Evidence from Job Durations in West Germany." *Labour Economics* 15: 309-325.

Bryson, Alex. 2013. "Do Temporary Workers Affect Workplace Performance." *Journal of Productivity Analysis* 39(2): 131-138.

Crimmann, Andreas, Kerstin Ziegler, Peter Ellguth, Susanne Kohaut, and Florian Lehmer. 2009. "Forschungsbericht zum Thema 'Arbeitnehmeruberlassung'." Forschungsbericht Arbeitsmarkt, 397. Nürnberg: Bundesministerium für Arbeit und Soziales.

Devicienti, Francesco, Paolo Naticchioni, and Andrea Ricci. 2017. "Temporary Employment, Demand Volatility, and Unions: Firm Level Evidence." *Industrial and Labor Relations Review* 71(1): 174-207.

Eichhorst, Werner, and Verena Tobsch. 2013. "Has Atypical Work Become Typical in Germany?" IZA Discussion Paper No. 7609. Bonn: IZA Institute of Labor Economics.

Ellguth, Peter, Susanne Kohaut, and Iris Möller. 2014. "The IAB Establishment Panel – Methodological Essentials and Data Quality." *Journal for Labour Market Research* 47(1-2): 27-41.

Hirsch, Boris. 2016. "Dual Labor Markets at Work: The Impact of Employers' Use of Temporary Agency Work on Regular Workers' Job Stability." *Industrial and Labor Relations Review* 69(5): 1191-1215.

Hirsch, Boris, and Steffen Müller. 2012. "The Productivity Effect of Temporary Agency Work: Evidence from German Panel Data." *Economic Journal* 122(562): F216-F235.

Holst, Hajo, Oliver Nachtwey, and Klaus Dörre. 2009. "Funktionswandel von Leiharbeit, Neu Nutzungsstrategien und ihre arbeits- und mitbestimmungspolitischen Folgen." Frankfurt: Studie im Auftrag der Otto-Brenner-Stiftung.

Houseman, Susan N. 2014. "Temporary Agency Work." IZA World of Labor. Doi: 10. 15185/izawol.27.

Jahn, Elke J., and Michael Rusholm. 2018. “The Cyclicality of the Stepping-Stone Effect of Temporary Agency Employment.” IZA Discussion Paper No. 11377. Bonn: IZA Institute of Labor Economics.

Kwasnika, Michael. 2009. “Does Temporary Help Work Provide a Stepping Stone to Regular Employment?” In David H. Autor (ed.), *Studies of Labor Market Intermediation*, pp. 335-372. Chicago, IL: University of Chicago Press.

Lambert, Diane. 1992. “Zero-inflated Poisson Regression, with an Application to Defects in Manufacturing.” *Technometrics* 34(1): 1–14.

Lehmer, Florian, and Kerstin Ziegler. 2010. “Brückenfunktion der Leiharbeit – Zumindest ein schmaler Steg.” IAB Kurzbericht 13/10. Nürnberg: Institut für Arbeitsmarkt und Berufsforschung/Institute for Employment Research.

Neugart, Michael, and Donald Storrie. 2006. “ The Emergence of Temporary Work Agencies.” *Oxford Economic Papers* 58(1): 137-156.

Pfeifer, Christian. 2005. “Flexibility, Dual Labor Markets, and Temporary Employment: Empirical Evidence from German Establishment Data.” *Management Revue* 16(3): 404-422.

Promberger, Markus. 2009. “Leiharbeit und betriebliche Mitbestimmung”. *Industrielle Beziehungen* 16(2): 192-194.

Salvatori, Andrea. 2009. “What Do Unions do to Temporary Employment?” IZA Discussion Paper No. 4554. Bonn: Forschungsinstitut zur Zukunft der Arbeit/IZA.

Schild, Armin, and Ingo Petzold. 2009. “Zeitarbeit aus Sicht der Gewerkschaften.” In Markus-Olivier Schwaab and Ariane Durin (eds.), pp. 87-93. *Zeitarbeit. Chancen – Erfahrungen – Herausforderungen*. Wiesbaden: Springer Gabler.

Spermann, Alexander. 2011. “The New Role of Temporary Agency Work in Germany.” IZA Discussion Paper No. 6180. Bonn: Forschungsinstitut zur Zukunft der Arbeit/IZA.

Table 1: Variable Definition and Establishment-Level Summary Statistics

Variable	Definition	Sample					
		All establishments		Establishments with a works council		Establishments without a works council	
		Obs.	Mean	Obs.	Mean	Obs.	Mean
Y_1	Number of temporary agency workers (TAWs)	97,060	5.720	27,264	17.789	69,581	0.971
Y_2	Number of FTC workers in the establishment	97,538	9.620	27,333	22.258	69,986	4.668
Y_3	Number of new hires with a FTC (from Jan. to June)	97,311	3.590	27,230	7.356	69,863	2.130
Y_4	Number of FTC workers converted into permanents (from Jan. to June). Sample restricted to establishments employing at least 1 FTC.	43,876	3.000	20,659	4.171	23,118	1.952
Y_5	Number of workers with a FTC renewed in the Jan-June interval. Sample restricted to establishments employing at least 1 FTC.	28,575	2.470	13,217	3.262	15,311	1.777
Works council	1/0 dummy: 1 if a works council is present	97,920	0.281	27,443	0.263	70,125	0.674
Sectoral agreement	1/0 dummy: 1 if the establishment is bound by an industry-wide wage agreement	97,769	0.372	27,443	0.565	70,125	0.296
Firm-level agreement	1/0 dummy: 1 if the establishment is bound by a company-level wage agreement	97,769	0.070	27,443	0.172	70,125	0.031
Product demand volatility (volatility)	For each year and for each industry, demand volatility is given by the average standard deviation of establishment log sales; that is, $volatility_i = (\frac{1}{N_i-1}\sum_{e=1}^{N_i}\{\log(sales)_e - \overline{\log(sales)}_i\}^2)^{1/2}$, where subscripts *e* and *i* denote establishment and industry, respectively, and N_i the number of establishments in industry *i* (and where subscript *t* is omitted). In a second step, we take the average of the past 6 years, so that the demand volatility measure in year *t* is the average over *t-1*, *t-2, …, t-6*. The sample comprises a total of forty-three, 3-digit level industries.	97,160	1.930	27,539	0.231	70,381	0.222
Establishment size:							
5-9	1/0 dummy: 1 if the establishment has 5 to 9 employees	98,160	0.234	27,539	0.020	70,381	0.318
10-19	1/0 dummy: 1 if the establishment has 10 to19 employees	98,160	0.177	27,539	0.043	70,381	0.230
20-49	1/0 dummy: 1 if the establishment has 20 to 49 employees	98,160	0.226	27,539	0.139	70,381	0.260
50-99	1/0 dummy: 1 if the establishment has 50 to 99 employees	98,160	0.127	27,539	0.176	70,381	0.108
100-249	1/0 dummy: 1 if the establishment has 100 to 249 employees	98,160	0.123	27,539	0.282	70,381	0.060
250+	1/0 dummy: 1 if the establishment has at least 250 employees	98,160	0.112	27,539	0.339	70,381	0.023
Establishment age:							
Before 1990	1/0 dummy: 1 if the establishment was founded before 1990	96,993	0.453	27,187	0.619	69,602	0.388
1990-1999	1/0 dummy: 1 if the establishment was founded between 1990 and 1999	96,993	0.309	27,187	0.237	69,602	0.337
After 1999	1/0 dummy: 1 if the establishment was founded after 1999	96,993	0.238	27,187	0.144	69,602	0.275
Workforce composition:							
Share of women	Share of female employees	98,107	0.396	27,505	0.353	70,363	0.413
Share of part-time	Share of part-time employees	94,935	0.109	26,622	0.123	68,118	0.104
Share of unskilled workers	Share of employees hired for simple tasks that do not require any vocational training certificate or corresponding professional experience	98,143	0.191	27,527	0.187	70,377	0.192
Share of skilled workers	Share of employees hired for complex tasks that require either a vocational training certificate, a corresponding measure of professional experience, or a university or college degree	98,140	0.696	27,524	0.758	70,377	0.671
Western Germany	1/0 dummy: 1 if the establishment is located in Western Germany	98,160	0.629	27,539	0.704	70,381	0.599
Wage bill	Sum of gross wages paid in June (in logs)	82,640	11.00	22,677	12.878	59,804	10.281
Export	1/0 dummy: 1 if the establishment engages in exporting	98,160	0.306	27,539	0.498	70,381	0.231
Outsourcing	1/0 dummy: 1 if parts of the establishment's activities have been outsourced	97,419	0.012	27,354	0.026	69,834	0.007
State-of-art technology	1/0 dummy: 1 if the overall technical state of the plant, machinery, and equipment of the establishment is state-of-the-art, compared with other establishments in the same industry (1 or 2 in the 1 to 5 Likert scale)	97,780	0.683	27,369	0.692	70,197	0.680
Competitive pressure	1/0 dummy: 1 if competitive pressure is reported to be high	78,040	0.446	21,117	0.537	56,757	0.411
Training	Share of employees with further training (from January through June)	86,321	0.234	23,132	0.276	63,021	0.219
Hiring rate	Number of hires divided by the total number of employees	97,742	0.065	27,400	0.039	70,121	0.074
Share of fixed-term contracts	Share of employees with a fixed-term contract	97,538	0.056	27,333	0.062	69,986	0.053

Note: The sample comprises all the establishments with at least 5 employees in the private, for profit sector. 19 separate industries are used for estimation purposes.

Source: IAB Establishment Panel, 2006-2015.

Table 2: Frequency Distribution of the Selected Five Response Variables (in percent)

All establishments	Count					
	0	1-9	10-49	50-99	100-999	≥1000
Relative frequency: Y_1	80.9	11.2	5.6	1.3	1.0	0.04
Y_2	57.5	26.8	11.5	2.2	1.9	0.04
Y_3	70.4	22.3	5.9	0.8	0.6	0.004
Y_4	53.5	39.6	6.1	0.5	0.3	–
Y_5	69.6	24.7	4.9	0.5	0.3	–

Note: Y_1 through Y_5 are defined in Table 1.
Source: IAB Establishment Panel, 2006-2015.

Table 3: Zero-Inflated Negative Binomial (ZINB) Model Estimates

	Dependent variable				
	No. of TAWs, Y_1 (1)	*No. of FTC Workers, Y_2* (2)	*No. of New Hires with a FTC, Y_3* (3)	*No. of FTC Conversions, Y_4* (4)	*No. of FTC Renewals, Y_5* (5)
Count model:					
Works council	-1.013 (0.336)***	0.110 (0.191)	0.647 (0.153)***	0.156 (0.244)	-0.244 (0.306)
Sectoral agreement	0.055 (0.065)	-0.073 (0.032)**	-0.045 (0.021)**	0.009 (0.040)	0.015 (0.048)
Firm-level agreement	0.208 (0.074)***	0.010 (0.044)	-0.007 (0.031)	0.001 (0.047)	0.062 (0.060)
Product demand volatility	-0.291 (0.149)*	0.202 (0.087)**	0.546 (0.067)***	0.191 (0.117)	0.111 (0.137)
Volatility *works council	0.476 (0.163)***	-0.248 (0.097)**	-0.400 (0.076)***	-0.224 (0.120)*	0.089 (0.151)
Training				0.049 (0.053)	-0.122 (0.073)*
Logit:					
Works council	-0.276 (0.420)	-0.678 (0.478)	-0.754 (0.428)*	-0.679 (0.489)	-0.938 (0.405)**
Sectoral agreement	0.271 (0.066)***	-0.071 (0.056)	0.012 (0.070)	0.076 (0.123)	0.039 (0.080)
Firm-level agreement	0.042 (0.098)	-0.117 (0.104)	-0.110 (0.108)	-0.048 (0.153)	-0.010 (0.105)
Product demand volatility	0.179 (0.148)	-0.070 (0.124)	-0.038 (0.168)	0.217 (0.236)	-0.045 (0.185)
Volatility *works council	-0.165 (0.207)	-0.001 (0.244)	0.332 (0.217)	0.587 (0.250)**	0.464 (0.207)**
Training				0.644 (0.209)***	-0.335 (0.120)***
Outcome-specific controls			Share of FTCs; Hiring rate	Share of FTCs	Share of FTCs
Diagnostic tests:					
(H0) No overdispersion (or alpha=0); versus (H1) overdispersion	alpha =1.95 95% interval: (1.85; 2.05)	1.19 (1.15; 1.22)	0.69 (0.67; 0.71)	1.13 (1.07; 1.20)	1.29 (1.19; 1.40)
(H0) Negative binomial model versus (H1) ZINB; Vuong test	z = 27.60 [p-value: 0.000]	32.69 [0.0000]	61.40 [0.0000]	15.46 [0.0000]	15.52 [0.0000]
(H0) ZIP model versus (H1) ZINB	chibar2(1)= 2.8e+05 [p-value: 0.0000]	0.3e+05 [0.0000]	1.0e+05 [0.0000]	4.8e+04 [0.0000]	3.4e+04 [0.0000]
Log Pseudo-Likelihood	-59,276.28	-11,0572.3	-60,613.94	-43,725.32	-27,828.98
Number of observations	61,668	61,420	61,039	26,476	21,652

Notes: The alpha statistic tests whether there is evidence of overdispersion. If alpha=0 is not rejected, there is no overdispersion and an ordinary count (Poisson) model is appropriate. The Vuong test compares the null of a standard negative binomial model vis-à-vis a zero-inflated negative binomial, while the likelihood ratio test, in the third row of the diagnostic block, compares the ZIP model (the null) against the ZINB model. In both cases, rejection of the null implies that ZINB is the preferred specification. The model includes industry, year, establishment size (employment), and location dummies. Further controls include establishment age, the share of women/of part-time workers/of employees hired for simple tasks that do not require any vocational training/of employees hired for complex tasks that require either vocational training or a university degree, the logarithm of the wage bill, and dummies for exports, outsourcing, state of technology and competitive pressure. Robust (cluster) standard errors are given in parentheses.
Source: IAB Establishment Panel, 2006-2015.

Table 4: The Most Important Reasons for Hiring Agency Workers (in percent)

		Speedy availability; short duration of assignment; and uncertainty about economic prospects (A, B or D)	Avoidance of costs in staff acquisition and separations; and ascertaining the worker's aptitude (E or F)	Required qualification is hard to find; and other reasons (C or G)
Works council:	1	88.2	6.0	5.7
	0	86.6	5.2	8.2
Type of collective agreement:	No collective agreement	86.5	6.3	7.2
	Firm-level agreement	87.3	6.3	6.3
	Sector-level agreement	88.7	4.7	6.6

Notes: The reported percentages are based on questions 49b of the 2010 IAB Establishment Panel questionnaire. Items A through G denote the most important reason for hiring agency workers: *speedy availability of required labor* [A]*; duration of assignment is expected to be short* (e.g. seasonal work, cover of peaks in demand) [B]; *required qualification is hard to find on the regular labor market* [C]; *uncertainty about economic prospects* [D]; *avoidance of costs and work involved in staff acquisition and separations* [E]; *ascertaining the worker's aptitude with a view to recruitment* [F]; *other reasons* [G]. These items are mutually exclusive.

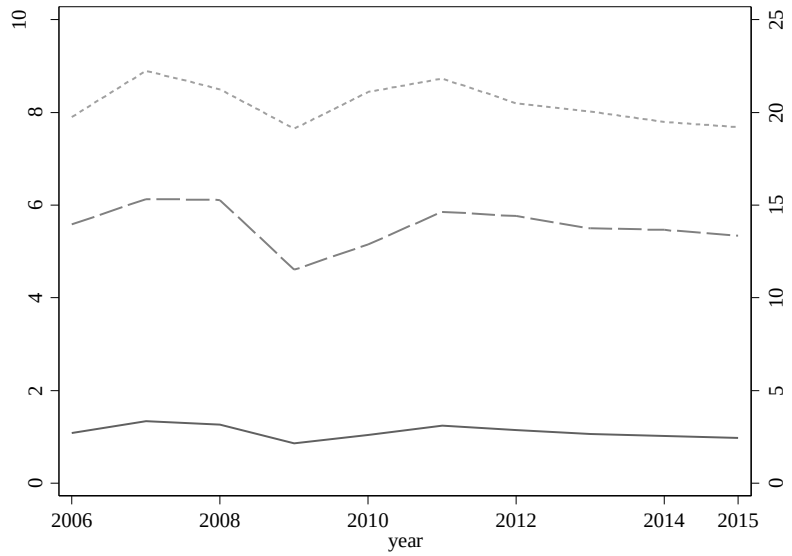
Table 5: Indicators of Changes in Human Resource Management (HRM) Practices

		HRM practices (E, F or I)	Other changes A, B, C, D, G, H, or J	No change
Works council:	1	23.3	45.1	31.6
	0	20.6	25.6	53.8
Type of collective agreement:	No collective agreement	21.3	29.2	49,5
	Firm-level agreement	23.5	38.3	38.3
	Sector-level agreement	20.7	33.1	46.2

Notes: The reported percentages are based questions 29b of the 2010 IAB Establishment Panel questionnaire. Items A through J denote the most important change within the last two years: *More reliance on internal labor* [A]; *expansion of purchase of products and services from external sources* [B]*; restructuring of procurement and distribution channels and/or of customer relations* [C]*; restructuring of departments or areas of activities* [D]*; dow-nward shifting of responsibilities and decisions* [E]*; introduction of team work/working groups with their own responsibilities* [F]*; introduction of units/departments carrying out their own cost and result calculations* [G]*; ecological measures in enterprise (e.g. eco, product and materials balances, eco audit)* [H]*; improvement of quality management* [I]*; others* [J]. These items are mutually exclusive.

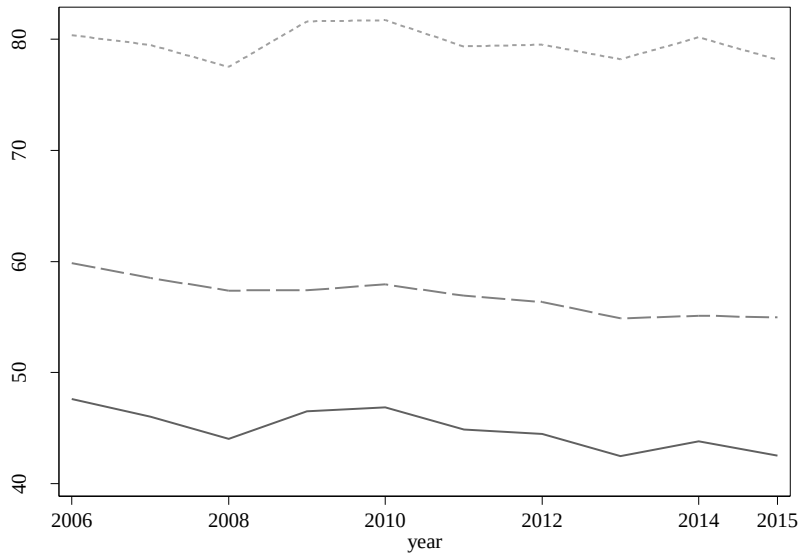
Figure 1: Temporary Agency Work, New Hires with a Fixed-Term Contract (FTC), FTC Conversions, and FTC Renewals (in percent) (unweighted)

(a) Temporary agency workers



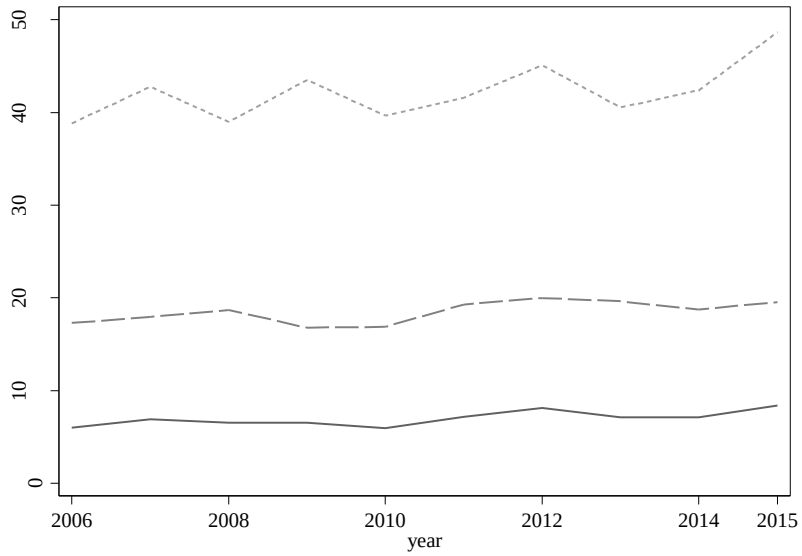
_____ Temps in establishment's workforce (left scale)
- - - - - - Temps in establishment's workforce in establishments with at least one temp (left scale)
– – – – Establishments with at least one temp (right scale)

(b) New hires with a fixed-term contract in establishments with new hires



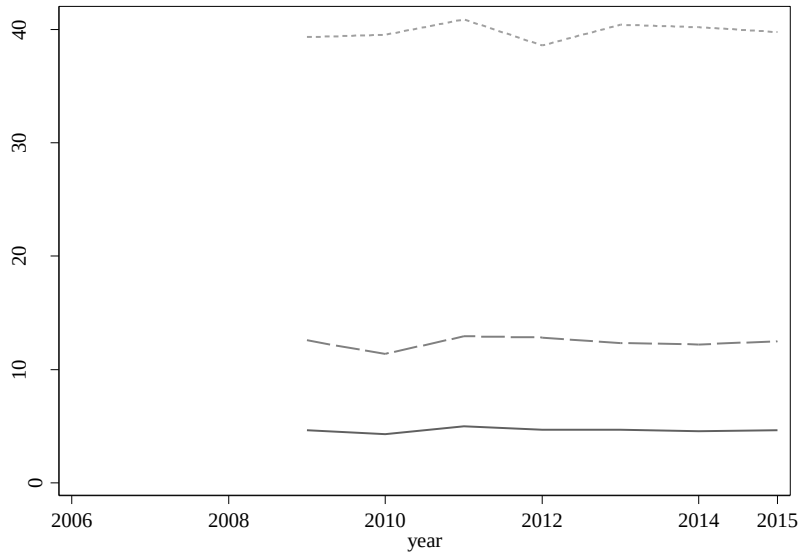
_____ New hires with a FTC in establishments with new hires
- - - - - - New hires with a FTC in establishments with at least one new hire with a FTC
– – – – Establishments with at least one new hire with a FTC

(c) FTC conversions into open-ended contracts *(OECs) in establishments with FTC workers*



_____ Conversions of FTCs into OECs in establishments with FTC workers
- - - - - - Conversions of FTCs into OECs in establishments with at least one FTC conversion
– – – – Establishments with at least one FTC conversion

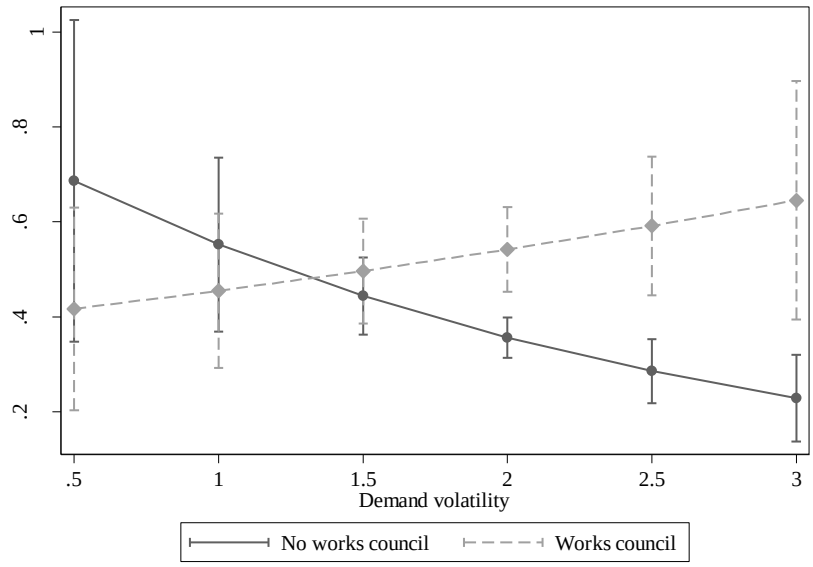
(d) FTC renewals in establishments with FTC workers



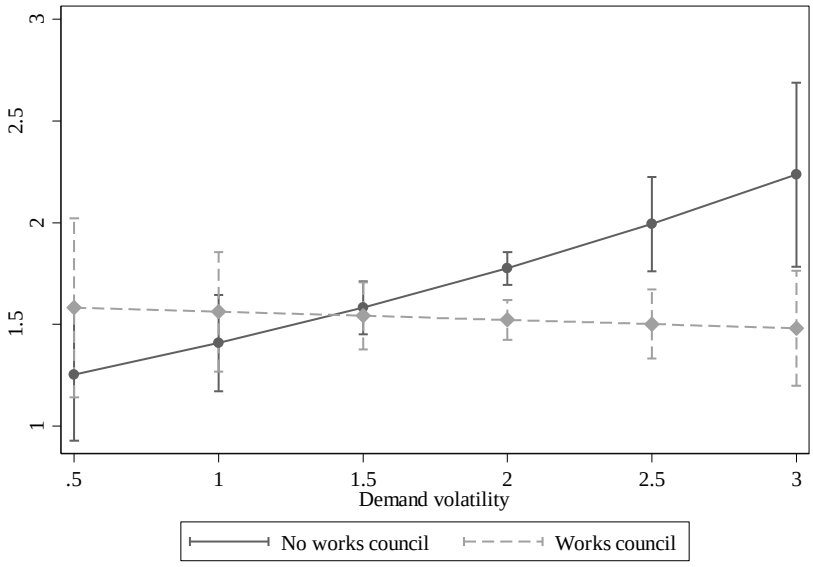
_____ FTC renewals in establishments with FTC workers
- - - - - - FTC renewals in establishments with at least one FTC renewal
– – – – Establishments with at least one FTC renewal

Figure 2: Predicted Number of Agency Temps and Fixed-Term Contract Workers in Establishments with and without Works Council

(a) Predicted number of temporary agency workers



(b) Predicted number of fixed-term contract workers



Notes: Establishments with at least 5 employees. The vertical bar denotes the 95% confidence interval for the corresponding level of product demand volatility. All other covariates included in the regression are set at their respective sample means.

Appendix Table 1: Zero-Inflated Negative Binomial (ZINB) Model Estimates for the Subsample of Establishments with 21 to 249 Employees

	Dependent variable				
	No. of TAWs, Y_1 (1)	*No. of FTC Workers, Y_2* (2)	*No. of New Hires with a FTC, Y_3* (3)	*No. of FTC Conversions, Y_4* (4)	*No. of FTC Renewals, Y_5* (5)
Count model:					
Works council	-1.033 (0.413)**	0.110 (0.223)	0.593 (0.154)***	-0.014 (0.279)	*No convergence*
Sectoral agreement	0.075 (0.081)	-0.016 (0.036)	-0.044 (0.023)*	0.012 (0.054)	
Firm-level agreement	0.215 (0.089)**	0.079 (0.052)	0.026 (0.032)	0.085 (0.059)	
Product demand volatility	-0.381 (0.183)**	0.152 (0.101)	0.411 (0.062)***	0.052 (0.118)	
Volatility *works council	0.478 (0.203)**	-0.198 (0.113)*	-0.344 (0.077)***	-0.121 (0.140)	
Training				0.052 (0.067)	
Logit:					
Works council	-0.455 (0.512)	-0.321 (0.534)	0.022 (0.601)	-0.159 (0.635)	
Sectoral agreement	0.185 (0.083)**	-0.036 (0.082)	0.120 (0.089)	0.127 (0.181)	
Firm-level agreement	0.005 (0.124)	0.014 (0.135)	-0.078 (0.136)	0.140 (0.186)	
Product demand volatility	0.148 (0.176)	0.020 (0.158)	-0.207 (0.221)	0.482 (0.283)*	
Volatility *works council	-0.038 (0.253)	-0.155 (0.277)	-0.068 (0.304)	0.225 (0.327)	
Training				-0.842 (0.294)***	
Outcome-specific controls			Share of FTCs; Hiring rate	Share of FTCs	
Number of observations	28,766	28,639	28,440	16,598	

Note: For each column, the diagnostic statistics are similar to those reported in Table 3.

Appendix Table 2: Zero-Inflated Negative Binomial (ZINB) Model Estimates, Excluding Establishments with Firm-Level Collective Bargaining

	Dependent variable				
	No. of TAWs, Y_1 (1)	*No. of Workers with a FTC, Y_2* (2)	*No. of New Hires with a FTC, Y_3* (3)	*No. of FTC Conversions, Y_4* (4)	*No. of FTC Renewals, Y_5* (5)
Count model:					
Works council	-0.621 (0.363)*	0.173 (0.211)	0.626 (0.165)***	0.238 (0.264)	-0.462 (0.341)
Sectoral agreement (SCB)	0.243 (0.120)**	-0.033 (0.042)	-0.007 (0.029)	0.047 (0.058)	0.089 (0.076)
SCB * works council	-0.286 (0.137)**	-0.090 (0.060)	-0.082 (0.043)*	-0.091 (0.076)	-0.074 (0.095)
Product demand volatility	-0.195 (0.153)	0.207 (0.091)**	0.564 (0.068)***	0.237 (0.120)**	-0.106 (0.137)
Volatility *works council	0.336 (0.172)*	-0.257 (0.104)**	-0.379 (0.081)***	-0.245 (0.128)*	0.219 (0.166)
Training				0.058 (0.057)	-0.119 (0.084)
Logit:					
Works council	-0.324 (0.453)	-0.681 (0.544)	-0.999 (0.462)**	-0.847 (0.592)	-1.111 (0.461)**
Sectoral agreement (SCB)	0.288 (0.088)***	-0.062 (0.063)	-0.127 (0.088)	-0.045 (0.177)	-0.027 (0.129)
SCB * works council	0.028 (0.132)	-0.036 (0.148)	0.313 (0.138)**	0.286 (0.237)	0.172 (0.164)
Product demand volatility	0.209 (0.152)	-0.061 (0.128)	-0.100 (0.176)	0.297 (0.273)	-0.192 (0.193)
Volatility *works council	-0.150 (0.220)	0.028 (0.273)	0.385 (0.230)*	0.633 (0.284)**	0.547 (0.225)**
Training				-0.644 (0.238)***	-0.330 (0.137)**
Outcome-specific controls			Share of FTCs, Hiring rate	Share of FTCs; Further training	Share of FTCs; Further training; 8 sectors instead of 19
Diagnostic tests:					
(H0) No overdispersion (or alpha=0); versus (H1) overdispersion	alpha =1.94 95% interval: (1.83; 2.05)	1.20 (1.16; 1.23)	0.69 (0.66; 0.71)	1.18 (1.11; 1.26)	1.40 (1.28; 1.53)
(H0) Negative binomial model versus (H1) ZINB; Vuong test	z = 26.15 [p-value: 0.000]	31.10 [0.0000]	58.84 [0.0000]	14.64 [0.0000]	13.03 [0.0000]
(H0) ZIP model versus (H1) ZINB	chibar2(1)= 2.3e+05 [p-value: 0.0000]	3.7e+05 [0.0000]	9.0e+04 [0.0000]	4.4e+04 [0.0000]	3.3e+04 [0.0000]
Log Pseudo-Likelihood	-51,648.91	-99,098.8	-53,851.38	-38,717.13	-24,577.92
Number of observations	57,650	57,412	57,059	23,854	19,502